AW		ater Audit So					erican Water Worl	
	Reportin	ng Workshee				Соруш	ght © 2014, All Ric	ins Resc
Click to access definition Water Audit Report for: Click to add a comment Reporting Year:		(2410005) 1/2019 - 12/2019						
lease enter data in the white cells below. Where available, metered values should put data by grading each component (n/a or 1-10) using the drop-down list to the	e left of the input ce	II. Hover the mouse o	ver the cell to obtain	a description c	te your confident of the grades	ence in the a	accuracy of the	
		as: MILLION GAL	LONS (US) PER Y	EAR				_
To select the correct data grading for each input, of the utility meets or exceeds <u>all</u> criteria for		Il grades below it.	n column 'E' and '				Error Adjustme /alue:	nts
VATER SUPPLIED	ANN SHEWN (E)	2,454.720		+ 2 3	Pcnt: 0.00% () O	/alue.	MG/Y
Volume from own sources: Water imported:	+ 7 5 + 7 n/a	0.000		+ ?		9 0		MG/Y
Water exported:	NAMES OF TAXABLE PARTY	0.000		+ ?	I have been been been	0		MG/Y
		0.454.700					for under-regis or over-registra	
WATER SUPPLIED:		2,454.720	MG/TF	EIII	ei positive 76			
UTHORIZED CONSUMPTION		4 000 050	1100/-				here:	
Billed metered: Billed unmetered:	+ 2 4 + 2 n/a	1,929.050	MG/Yr MG/Yr				ns below	
Unbilled metered:	+ ? n/a	0.000			Pcnt:	١	/alue:	
Unbilled unmetered:	+ ? 5	6.137				0 🔘 6	5.137	MG/
						^		
AUTHORIZED CONSUMPTION:		1,935.187	MG/Yr				buttons to select entage of water	
							supplied OR	
/ATER LOSSES (Water Supplied - Authorized Consumption)		519.533	MG/Yr			[value	
pparent Losses	<u> </u>				Pont:	. ↓ \	Value:	
Unauthorized consumption:	# 2	6.137	MG/Yr		0.25%	O		MG/
Default option selected for unauthorized consu		ing of 5 is applied	but not displaye	d				
Customer metering inaccuracies:	sentone mentionens (************************************	29.376			1.50%	0 0		MG/
Systematic data handling errors:			MG/Yr			0 0		MG/
Default option selected for Systematic data	handling errors	- a grading of 5 is	applied but not	displayed				
Real Losses (Current Annual Real Losses or CARL) Real Losses = Water Losses - Apparent Losses:		479.197	MG/Yr					
WATER LOSSES:		519.533	MG/Yr					
NON-REVENUE WATER NON-REVENUE WATER:	2	525.670	MG/Yr					
Water Losses + Unbilled Metered + Unbilled Unmetered								
SYSTEM DATA	OWNER WORKSON C. F. J. C.	180.0	mileo					
Length of mains: Number of active AND inactive service connections:		180.0 12,425						
Service connection density:	2	69	conn./mile main					
Are customer meters typically located at the curbstop or property line?		Yes		service line, be				
Average length of customer service line:	tto zero and a	data aradina scor	boundary of 10 bas been	, that is the resp	onsibility of th	e utility)		
Average length of customer service line has been se Average operating pressure:		49.4		аррпеч				
Average operating prossure.								
COST DATA								
Total annual cost of operating water system:	2 10	\$5,522,228	\$/Year					
Customer retail unit cost (applied to Apparent Losses):	÷ 2 8		\$/100 cubic feet	(ccf)				
Variable production cost (applied to Real Losses):	+ ? 5		\$/Million gallons	Use Custom	er Retail Unit Co	st to value re	eal losses	
Variable production cost (applied to riceal cosses).	ESSER RECORDS O	V _00.00	y William Saliene	osc castoni	CI NCLUM OME O	SC to value in	-a., 1035-C	
WATER AUDIT DATA VALIDITY SCORE:								
***	YOUR SCORE	S: 54 out of 100 *	+					
A weighted scale for the components of consump	ption and water los	s is included in the c	alculation of the Wa	ter Audit Data V	alidity Score			
PRIORITY AREAS FOR ATTENTION:								
Based on the information provided, audit accuracy can be improved by addressi	ing the following co	mponents:						
1: Volume from own sources	9							
2: Customer metering inaccuracies								
3: Billed metered								



System Attributes and Performance Indicators AWWA Free Water Audit Software:

O	connections/mile of pipeline	This performance indicator applies for systems with a low service connection density of less than 32 service connections/mile of pipeline
	9.37	Infrastructure Leakage Index (ILI) [CARL/UARL]:
479.20 million gallons/year	479.20	From Above, Real Losses = Current Annual Real Losses (CARL):
2.14 gallons/connection/day/psi	2.14	Real Losses per service connection per day per psi pressure:
	N/A	Real Losses per length of main per day*:
105.66 gallons/connection/day	105.66	Real Losses per service connection per day:
8.89 gallons/connection/day	8.89	Apparent Losses per service connection per day:
4.6% Real Losses valued at Variable Production Cost	4.6%	Non-revenue water as percent by cost of operating system:
	21.4%	Non-revenue water as percent by volume of Water Supplied:
		Performance Indicators:
Return to Reporting Worksheet to change this assumption		
	\$138,296	Annual cost of Real Losses: [
	\$112,156	Annual cost of Apparent Losses: [
[MG/Yr	51.16 MG/Yr	Unavoidable Annual Real Losses (UARL): [
MG/Yr	519.533 MG/Yr	= Water Losses:
MG/Yr	479.197 MG/Yr	+ Real Losses:
MG/Yr	40.336 MG/Yr	Apparent Losses:
	IS: 54 out of 100 ***	*** YOUR WATER AUDIT DATA VALIDITY SCORE IS: 54 out of 100 ***
		Reporting Year: 2019 1/2019 - 12/2019
		Water Audit Report for: City of Los Banos (2410005)



AWWA Free Water Audit Software: Water Balance

Water Audit Report for: City of Los Banos (2410005)

Water Imported 0.000			2,454.720	errors)	Own Sources (Adjusted for known				
		Water Supplied 2,454.720					Water Exported 0.000		
519.533	Water Losses			1,935.187	Authorized Consumption			Data Validity Score: 54	Reporting Year: 2019
Real Losses 479.197		Apparent Losses 40.336	6.137	Unbilled Authorized Consumption	1,929.050	Billed Authorized Consumption		54	2019
Mains Not broken down Leakage and Overflows at Utility's Storage Tanks Not broken down Leakage on Service Connections Not broken down	Systematic Data Handling Errors 4.823	Unauthorized Consumption 6.137 Customer Metering Inaccuracies 29.376	Unbilled Unmetered Consumption 6.137	Unbilled Metered Consumption 0.000	Billed Unmetered Consumption 0.000	Billed Metered Consumption (water exported is removed) 1,929.050	Billed Water Exported		1/2019 - 12/2019
		525.670		Non-Revenue Water (NRW)	1,929.050	Revenue Water			

Water Imported:	Improvements to attain higher data grading for "Master meter and supply error adjustment" component:	Volume from own sources master meter and supply error adjustment:	improvements to attain higher data grading for "Volume from own Sources" component	Volume from own sources:		Grading >>>	
Select r/a if the water utility's supply is exclusively from its own water resources (no bulk purchased/ imported water)		Select r/a only if the water utility fields to have meters on its sources of supply		Select this grading only if the water utility purchase/imports all of its water resources (i.e., has no sources of its own).		n/a	The
Less than 25% of imported water sources are metered, remaining sources are estimated. No regular meter accuracy testing.	Develop a plan to restructure le recordkeeping system to capture al recordkeeping system to capture al flow data; set a procedure to review flow data set a procedure to review flow data on a delay beals to detect input errore. Obtain more relable information about existing maters by conducting field impostions of the process and related instrumentation, medical manufacturer and obtaining manufacturer.	Inventory information on meters and paper records of measured volumes axist but are incomplete and/or in a very crude condition; data error cannot be determined	to qualify for 2: Organize and leunch efforts to collect data for determining volume from own sources	Less than 25% of water production sources are metered, remaining sources are estimated. No regular meter accuracy testing or electronic calibration conducted.		1	grading assigned to each au
25% -50% of imported water sources are metered; other sources Conditions between estimated. No regular meter 2 and 4 accuracy testing.	hasail automatic dataloging equipment on production meters. Complete intestation of level instrumentation at all tankestroage facilities and indude tank level data in automatic activation couldness and indude tank level data in constitute a computerzed sharp computerzed years. Constitute a computerzed sharp or spreadsheat to archive input volumes a tankétorigas volume cinarges and importexport flows in order to determine the composite activation of the distribution system. Set a typicade volume for the distribution system. Set a procedure to tredwy this data on a monthly basis to odetect gross anomalies and data gaps.	No automatic datalogging of production volumes, daily readings are scribed on paper records without any accountability controls. Flows are not balanced across the water distribution system: tankstorage elevation changes are not employed in calculating the "Yolume from own sources" component and archived flow dafa is adjusted only when grossly evident data error occurs.	to qualify for 4. Locate all water production sources on maps and in the field, aunch meter socuracy testing for existing meters, begin to install meters on unmetered water production sources and replace any obsolete/defective meters.	25% - 50% of treated water production sources are melaned; other sources estimated. Nor equilar mater accuracy testing or electronic calibration conducted.		2	dit component and the corresp
Conditions between 2 and 4	ment on production et el instrumentation et de tank level data in or spreadahent to volume changes en changes and without on system. Set a monthly basis to a data gaps.	Conditions between 2 and 4	on maps and in the for existing meters, ad water production uddefective meters.	Conditions between 2 and 4		3	onding recomme
50% - 75% of imported water sources are metered, other sources estimated. Occasional meter accuracy testing conducted.	to qualify for 8: Refine computerized data oblection and archive to include hourly production material ablaction are reviewed at least on a vesely basis to detect specific data anomalies and pape, well basis to detect specific data anomalies and pape. Use daily net storage othange to balance flows in calculating "Valler Supplied" volume. Necessary carrections to data errors are implemented on a weekly basis.	Production meter data is logged automatically in electronic format and reviewed at least on a monthly basis with necessary corrections implemented. "Volume from who sources" tabulations include estimate of daily changes in a stankastroage facilities. Meter data errors occut, or occasional meter testing deems this necessary.	to quality for 8. Formalize annual meter accuracy testing for all source meters, specify the frequency of testing. Complete installation of meters on unmetered water production sources and complete replacement of all obsolete/defective meters.	50% - 75% of treated water production sources are metered, other sources estimated, Occasional meter accuracy testing or electronic calibration conducted.		4	anded improvements and action
Conditions between 4 and 6	and archive to include reviewed at least on a anomalies and gaps. anomalies and gaps. The control force flows in calculation any control force flows in calculation.	Conditions between 4 and 6	leasing for all source testing. Complete d water production of all obsolete/defective	Conditions between 4 and 6	WATER SUPPLIED	5	ns are highlighter
At least 75% of imported water sources are metered, meter accuracy teeting and/or electronic calibration of related instrumentation is conducted amnually for all meter installations. Least than 25% of tested meters are found outside of 14-5% accuracy.	Ensure that all flow data is collected and archived on at least an hourly basis. All data is writewed and detected errors corrected each business day. Tankfetorage levels variations are employed in calculating beanced "Water Supplied" component. Adjust production meter data for gross error and inaccuracy confirmed by testing.	Hourly production meter data logged automatically & reviewed on at least a weekly basis. Data is adjusted to correct gross error when meterinatum equipment imalfunction is detected; and/or error is confirmed by meter accuracy leasting. Tankfotrage facility elevation calculating a balanced "Volume from own sources" component, and data are gone to the product of the accidence of	Conduct annual mater accuracy testing and calibration of related instrumentation on all mater installations on a regular basis. Complete project to install new, or replace detective earting meters as that earting production meter accuracy. population is metered. Repair or replace meters outside of 4-6% accuracy.	At least 75% of treated water production sources are metered, or at least 80% of the 30% of the source flow is defined from metered sources. Meter accuracy testing and/or electronic calibration of related netrumentation is conducted annually. Less than 25% of tested meters are found outside of 4,6% accuracy.	8	6	The grading assigned to each audit component and the corresponding recommended improvements and actions are highlighted in yellow. Audit accuracy is likely to be improved by prioritizing those items shown in red
Conditions between 6 and 8	and archived on at awed and detected Tankfetorage levels g belanced "Water ction meter data for med by testing.	Conditions between 6 and 8	ig and calibration of installations on a stall new, or replace re production mater ce meters outside of	Conditions between 6 and 8		7	ly to be improve
100% of imported water sources are metered, meter accuracy testing and electronic calibration of related instrumentation is conducted annually, less than 10% of meters are found outside of 4/- 6% accuracy	to <u>ouasity for 10</u> . Link all production and tank/etirage finality elevation change data to a Supervisory Control & Data Acquisition (SCADA) System or similar computerized moritoria/control system, and establish puterment from bandering disportion and regularly calibrate between SCADA and source meters. Data is reviewed and corrected each business day.	Continuous production meter data s logged automatically & reviewed each business day. Data is editured to correct gross error from detected meterinistrumentation equipment meturinous and/or results of meter accuracy testing. Tank/discape facility elevation changes are automatically used in "Volume from own sources" tabulations and data gaps in the archived data are corrected on a daly basis.	to qualify.for.10. Maintain annual meter accuracy testing and calibration of related instrumentation for all meter installations. Repair or replace meters outside of +4-2 % accuracy. Investigate new meters outside of +6-2 % accuracy. Investigate new meter technology, plot one or more replacementa with innovative meters in attempt to further improve meter accuracy.	100% of treated water production sources are metered, meter accuracy testing and electronic calibration of related instrumentation is conducted annually, least than 10% of meters are found outside of +/- 6% accuracy		8	d by prioritizing those items sho
Conditions between 8 and 10	celly elevation change Acquietton (SCADA) broing/control system, ucing algorithm and of source metans. Data 1 business day.	Conditions between 8 and 10	ing and calibration of netalations. Repair or netalations. Repair or uracy, investigate new a replacements with ther improve meter.	Conditions between 8 and 10		9	wn in red
100% of imported water sources are metered, meter sources) testing and electronic calibration of related instrumentation is conducted sentine annually for all near installations, with less than 10% of accuracy tests found of t-5 % accuracy, and the contraction of t-5 % accuracy.	Monitor meet innovations for development of more accurate and lee appreciate more accurate and lee appreciate formeters. Continue to replace or repair meters as they perform outside of desired accurately mints. Stay advasts of new and more accurate water level institutions for the condition of the conditions in the condition to the conditions in decrease volume. Keep current with SCADA and data managed and error free.	Computarized system (SCADA or similar) automatically balances flows from all sources and scorages, results are reviewed each business day. Tight accountability controls ensure that all data gaps that occur in the archivation of the service of the	Standardozamete accuracy test frequency to entire and or meter accuracy test frequency to senti-annual, or more frequent, for all maters. Repail or replace meters outded or 47-59, accuracy. Continually investigate/pilot improving matering technology.	100% of treated water production sources are melared, meter accuracy testing and electronic califaction for related instrumentation is conducted sent-annually, with less than 10% found outside of 4,2% accuracy. Procedures are reviewed by a third party knowledgeable in the M30 party knowledgeable in the M30 party knowledgeable in the M30 party knowledgeable in the M30.		10	

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Improvements to attain higher data grading for "Water Exported Volume" component: (Note: Issailly, if the water utility being authors solis (Exports) water to a mejonomy burchestly Utility, it is the supportability of the utility exporting the water to metaloring installation measuring the Exported volume. The utility exporting the water should ensure that adequate meter utility exporting the water should ensure that adequate of the Water feeling the water should ensure that adequate of the Water feeling the water should ensure that adequate of the Water feeling the water should ensure that adequate of the Water feeling the water should ensure that adequate of the Water feeling the water feeling the water feeling that the water feeling the water feeling the water feeling that the water feeling the water feeling that the water feeling the water feeling that the water feeling that the water feeling the water feeling the water feeling that the water feeling that the water feeling that the water feeling that the water feeling the water feeling the water feeling the water feeling the water f	Water Exported:	Improvements to attain higher data grading for "Vetes imported master moter and supply error adjusment" component:	Water imported master meter and supply error adjustment	Improvements to attain higher data grading for "Water Imported Volume" component (Wolz: usually the water supplies selling the water. The Listy being autitled is responsible to maintain the melering instellation measuring the imported volume. The utility should coordinate carefully with the Exporter to ensure that actequate meler upleas place and an accurate measure of the Water imported volume is quartified.)	Grading >>>
	Select n/a if the water utility sells no bulk water to neighboring water to neighboring water utilities (no exported water sales)		Select his if the imported water supply is unmekered, with imported water quantities estimated on the billing invoices earn by the Exporter to the purchasing Littley.		n/a
to quality for 2. Review bulk water sales agreements with purchasing utilities; confirm requirements for use & upkeep of accurate metering, leave to install new, or replace defective meters as needed.	Less than 25% of exported water sources are metered, remaining sources are estimated. No regular meter accuracy testing.	to qualify for 2. Develop a plan to restructure recordiscepting system to capture all flow data; set a procedure to relevant flow data; set a procedure to relevant flow data on a daily basis to detect input errors. Oblain more reliable information about existing meters and cleated instrumentation and obtaining manufacturer fleerature. Review the written sagreement between the selling and purchasing Utility.	Inventory information on imported meters and paper records of meters and paper records of measured volumes exist but are incomplete and/or in a very crude condition, data error cannot be determined Written agreement(s) with water Exporter(s) are missing or written in vague language concerning meter meanagement and testing.	to qualify for 2: Review bulk water purchase agreements with partner suppliers; confirm requirements for use and maintenance of accurate metering identify needs for raw or replacement meters with goal to meter all imported water sources.	-
To qualify for a control when the means in the control when the control when the control when the control when the control was	25%, 50% of exported water sources are matered; other sources Conditions between estimated. (No call mater 2 and 4 accuracy testing.	to qualify for 4: Install automatic datalogging equipment on imported supply metres. Set a procedure to review this data on a supply metres. Set a procedure to review this data on a monthly basis to detect gross anomalies and data gaps. Launch discussions with the Exponities to jurity review terms of the written agreements regarding meter accuracy testing and data management; revise the terms as necessary.	No automatic datalogging of imported supply volumes; daily readings are scribed on paper records without any accountability countrols to confirm data accuracy and the absence of errors and data apps in recorded volumes. Written agreement requires mater accuracy testing but it is vague on the details of how and who conducts the testing.	To qualify for 4: Locate all imported water sources on maps and in the field, launch meter accuracy resting for existing meters, begin to install meters on unmetered imported water interconnections and replace obsolets/defective meters interconnections and replace obsolets/defective meters.	2
maps and in field, string meters, begin supplied water to defeative meters	Conditions between 2 and 4	ment on imported wive this data on a lies and data gaps. It is to joinly releaving meter accuracy size the terms as	Conditions between 2 and 4	n maps and in the or existing meters, and in the distribution of the control of t	3
to qualify for 8: Formalize annual matter accuracy testing for all exported water meters. Continue initiatization of meters on unnetered exported water initiatizations and replacement of obsolete/defective meters.	50% - 75% of exported water sources are metered, other sources estimated. Occasional meter accuracy testing conducted.	to qualifix for E: Refine computerized data colection and archive to include hourly imported supply metered flow data that is reviewed at least on a weekly basis to deteor specific data anomalies and gaps. Make necessary correction to errora/data errors on a weekly basis.	Imported supply metered flow data is logged automatically in electronic format and reviewed at feast on a monthly basis by the Exporter whith Passis by the Exporter when gross data errors are distracted. A contenent data trail exists for this process to protect between the selling and the purchasing Utility. Written agreement exists and closts for meter accuracy testing and data meters requirements and closs for meter accuracy testing and data management.	To qualify for 8: Formatice annual mater accuracy testing for all imported water meters, planning for both regular meter accuracy testing and calibration of the eleted first meteration. Conflue installation of meters on unmetered imported water interconnections and desament of obsolere defective meters.	4
sting for all exported melans on unmedies not episcement of retien.	Conditions between 4 and 6	and archive to includ data that is eviewed possible data anomale dona to erroral data seels.	Conditions between 4 and 5	sising for all imported ular meter accuracy distribution in the factor accuracy ad instrumentation. Introduced imported placement of etera,	OI
Complete project to into qualify for 8: Complete project to male new or replace defective, maters of on all exported vester instructorisections, Maintain annual meter accuracy testing for all exported water meters. Repair or replace meters outsides of +/- 61/s accuracy.	At least 75% of exported water sources are metered, meter accuracy treating and/or electrical electrical calibration conducted annual electrical calibration of tested meters are found outside of tested meters are found outside of +6% accuracy.	to quality for 8: Ensure that all imported supply metered flow data is collected and erichlyed on at least an hourly beals. All data is is reviewed and erichlydidate gaps are corrected each business day.	Hourly imported supply metered data is logged automatically & reviewed on at least a weekly basis by the Exporter. Data is a guisted to correct meterinature matiation equipment meterinature matiation equipment of error confirmed by meter accuracy testing. Any data gapes in the archivated data are detected and corrected during the weekly review. A coherent data trail exists for this process to protect both the selling and the purchasing Utility.	to qualify for 8: Complete project to install new or replace defective, meters on all imported water instronmetications. Maintain annual meter accuracy leading for all imported water meters and conduct calibration of related instrumentation at least annually. Repair or replace meters outside of +/- 6% accuracy.	6
a defectiva, materiale Maintain annual di water meters. 7- 6% accuracy.	Conditions between 6 and 8	ried flow data is un'y basis. All data corrected each	Conditions between 6 and 8	e defective, meters Maintain annual water meters and entation at least utaide of +/- 6%	7
to <u>quality for 10;</u> Maintain annual meter accurrecy testing for all meters. Repair or replace meters outside of vs. 2% accurrecy. Investigate new meter technology, pilot one or more replacements with innovative meters in attempt to improve meter accuracy.	100% of exported water sources are metered, meter accuracy testing and selection of related instrumentations conflicted instrumentation conflicted annually, less than 10% of meters are found outside of +1.5% accuracy	Loguelly for 10: Conduct accountability checks to confirm that all imported supply metered data is reviewed and corrected each business day by the Exports. Results of all meter accuracy tests and data corrections should be evaluable for sharing between the Exports and the purchasing tility. Establish as checkula for a regular review and updating of the contractual language in the written agreement between the selfing and the purchasing the written agreement between the selfing and the purchasing the written agreement between the selfing and the purchasing the written agreement between the selfing and the purchasing the written agreement between the selfing and the purchasing the written agreement between the selfing and the purchasing the written agreement between the selfing and the purchasing the written agreement the selfing and the purchasing the written agreement between the selfing and the purchasing the written agreement between the selfing and the purchasing the written agreement between the selfing and the purchasing the written agreement between the selfing and the purchasing the written agreement between the selfing and the purchasing the written agreement between the selfing and the purchasing the written agreement between the selfing and the purchasing the written agreement between the selfing and the purchasing the written agreement between the selfing and the purchasing the pur	Continuous imported supply meterad flow data is logged automatically & reviewed each business day by the importer. Data is adjusted to correct meterinest connect content meterinest content content meterinest content meter	io <u>quaff./or.10.</u> Conduct mater accuracy testing for all meters on a semi- annual basis, along with calibration of all related inatrumentation. Repair or replace meters outside of +/. 3%, accuracy. Investigate new meter technology, pilot one or more replacements with innovative meters in attempt to improve meter accuracy.	8
); (or all meters, Repail accuracy, Investigate tore replacements with rove meter accuracy.	Conditions between 8 and 10	Infirm that all imported softment as all imported sorrected each business or corrected each business or shall be between the stability between the stability and the purchasility and the purchasility and the purchasility or years.	Conditions between 8 and 10). Implets on a semi- tion of all related eters outside of +/- 3% chinology; pilot one or meters in attempt to reacy.	9
Innaintain 10: Standardz meter accuracy test frequency to semi-annual, or more requent, frost meters. Repair replace meters cutside of 14. 3% accuracy. Continually investigate/pilot improving metering technology.	100% of exported water sources are meteod, mete socialize y testing and electronic callistendor of related instrumentation is conducted semi-annually for all meter installations, with less than 10% of coursely tests found outside of +7, 3% accuracy tests found outside of +7, 3% accuracy.	Monitor materials 10: Monitor materials and less expansive formatters, work with the poporar to help clearly materials and less expansive formaters, work with the poporar to help clearly material population and materials productive relations, open and materials productive relations, open and materials productive relations, open and materials productive relations, who notes and explicit arguage that writers are expected that purpose the means the origing needs of all parties.	Computerized system (SCADA or shifted purposed data which is reviewed each business day which is reviewed each business day by the Exporter. Tight accountability controls ensure that elementary in the archived floor data are quicity detacted and corrected. A reliable data trail exists and contract provisions for meter testing and data managament are reviewed by the ealing and purchasing Liftly at least once every five years.	in naintain 10: Standardiz meter accuracy test frequency to semi-annual, or more frequent for all meters. Continue to conduct salibration of related natumentation on a semi-annual basis. Repair or replace meters outside of +1-3 % accuracy. Commusily investigate/plot in proving metering technology.	10

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dit Software v5.0	
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Improvements to attain higher data grading for "Bled Metered Consumption" component:	Billed meterod:		Improvements to attain higher data grading for "Veter exported master meter and supply error adjustment" component:	Water exported master meter and supply error adjustment:	Grading >>>
If na is selected because the customer meter population is unmeared, consider establishing a new policy to meter the customer population and employ water rates based upon metered volumes.	n/a (not applicable). Select n/a only if the entite customer population is not metered and is billed for water service on a flat or fixed rate basis. In such a case the volume entered must be zero.			Select n/a only if the water utility falls to have meters on its exported supply interconnections.	n/a
to qualify for 2: Conduct investigations or trains of customer meters to select appropriate meter models. Budgets funding for meter installations. Investigate volume based water rate structures.	Less than 50% of customers with volume-based billings from meter readings, flat or fleed rate billing exists for the majority of the customer population		<u>to qualify for 2</u> . Develop a jain to restructure recordineaping system to capture all flow data; set a procedure to review frow data on a daily basis to detect input errors. Obtain more reliable information about existing meters by conducting field inspections of the procedure of celabric instrumentation, and obtaining manufacture illerature. Review the written agreement between the suffer yearing the water and the purchasing Utility.	inventory information on exported meters and paper records of measured volumes used but are incomplete and/or in a very crude condition, data enry crude condition, data enry crude condition, data enry crude with purchasing the volume are missing or vritten in vegue language concerting meter management and testing	
Durchase and install meters on unmetered accounts. Implement policies to improve meter reading auccess Catalog meter information during meter read visits (cately againtoded of eating meters. Test a minimal number of meters to accuracy, install computerized billing system.	At least 50% of customers with volume-based billing from meter reads; flat rate billing for others. Manual meter reads flat rate billing for others. Wanual meter reading is conducted, with least than 50% meter read success rate, remaining accounts' consumption is estimated. Limited meter records, no regular meter testing or replacement. Billing data maintained on paper records, with no auditing.		its qualify for a supported supply means on exported supply meters. Set a procedure to review this data on a monthly basis to detect goes anomalies and deta gaps. Launch decreasions with the purchasing utilises to pilot	No automatic datalogging of exported supply volumes; daily readings are scribed on paper records without any accountability controls to confirm data socuracy and the absence of errors and data gaps in recorded volumes. Writen agreement requires meter accuracy testing but it is vegue on the details of how and who conducts the testing.	2
netered accounts. reading success. reading success. refer read visits to refer read visits to refer and visits and the second visits to refer and visits and the second reference of the second refere	Conditions between 2 and 4		went on exported away to see a consideration of the see and data gaps. If you will be so jointly the see a consideration meter mrt. revise the terms	Conditions between 2 and 4	٥
to qualify for E Purchase and install meters on unmetered accounts. Eliminate flat fee billing and establish appropriate water rate structure based upon measured consumption. Confinue to achieve variifiable success in removing manual meter reputar meter replacement program. Launch a program of global taling statetacs by utility personnel.	At least 75% of customers with volume-based, tilling from meter reads; filter offset are billing for meter reads; filter offset are billing for reading accounts. Manual meter reading accounts with at least 50% meter reading accounts with at least reads is estimated. Purchase records wifly ago of customer meters; only way finited meter accuracy testing is conducted. Customer meters are applicated only upon complete failure. Computational billing records exist, but only spondiol information auditing conducted.	AUTHORIZED CONSUMPTION	Io quality for g. Refine computerized data collection and archive to include houly exported supply metered flow data that it reviewed at least on a weekly basis to detect specific data anomalies and gaps. Make necessary corrections to erroraddata errors on a weekly basis.	Exported metered flow data is logged automatically in electronic format and reviewed at feast on a monthly basis, with necessary correctors implemented. Welter data is adjusted by the utility saling (exporting) the vaster when gross data enters are defected. A coherent data trail exists for this process to protect both the utility exporting the water and the purchasing utility. Written agreement exists and cleanly states requirements and to desire the accuracy sesting and data anonangement.	4
imetred accounts. spopopiate water rai sungtion. Confinue to confi	Conditions between 4 and 6	NSUMPTION	archive to include factorized that in the factorized fa	Conditions between 4 and 6	·
Purchase and install meters on unmetered accounts. If customer meter reading successer rate is less than 97%, assess cost-effectiveness of Automatic Meter Reading 19 (AMR) or Advanced Metering Infestruturie (AMI) system of for portion or entire system; go otherwise achieve engoing increase rate to 97% or higher. Refine meter accuracy testing program. If Set in hele replacement goals based upon accuracy testing recorde by utility personnel and implement third party autifing at least once every fire years.	At least 90% of customers with volume-based billing from methor reading consumption for remaining accounts is estimated. Manual customer meter reading success reading success reading success reading success reading success reading success that is consumption for accounts with falled reads is estimated. Good customer meter records seist, but only ambied meter accuracy feating is conducted. Regular replacement is conducted for the oldest meters. Computerized billing records assist that annual auditing of summary statistics conducted by utility personnel.		to <u>quality for 8:</u> Ensure that all exported metered flow data is collected and archived on at least an hourly basis. At data is reviewed and errors/data gaps are corrected each business day.	Hourly exported supply metered data is logged automatically & reviewed on at least a weekly basis by the utility selling the water. Data is adjusted to correct gross error when meterinatumentation explanent mattunction is detected, and to correct for error found by meter accuracy testing. Any data agaps in the surbivation data are detected and corrected data are detected and existing exporting to protect both the seeling devocating utility and the purchasing Utility.	
retried accounts. If the least ham 97%, for the least ham 97%, for the least ham 97%, for the least Meter Repair under (AMI) system ongoing find success rate to fifting success rate to fifting success rate to fifting success rate to got detailed billing goment third party fine years.	Conditions between 6 and 6		dsta is collected and Addata is reviewed and bash business day,	Conditions between 6 and 8	-
to qualify for 10. Purch area and install meters on runnelined accounts, Launch Automatic Meter Reading (AMR) to Advanced Metering in Frastructure (AMI) system trible if meanual meter reading success rate and active size 10% is not achieved within a five-year program. Combined meter accounts / teating program. Conduct planning and budgeting for large scale meter replacement beasted upon meter if or cycle enabytes using cumulative flow target. Continue annual detailed obling data auding by utility personnel and conduct third party auding at least once every three years.	At least 97% of customers exist with volume-based bling from meter reads. At least 90% customer meter reading success rate; gg at least 80% read success rate, vg at least 80% read success rate with planning and budgeting for rises of Automatic Meter Reading (AMR) or Advanced Meter Reading (AMR) or Advanced Meter records. Regular meter accuracy testing guides replacement of statistically significant number of readers acching significant number of meter a each year. Routine audible of computerized billing records for global and detailed establishes occurs amnually by utility personnel, and is verified by intig party at least once every five y years.		Conduct accountability checks to confirm that all exported materies flow data is reflexed and corrected each business day by the utility selling the vater. Results of all meter accuracy tests and data corrections should be available for a haring between the utility and the purchasing utility. Eachlish as checkle for a regular review and updating of the contractual language in the writter agreements with the purchasing utilities, at least every five years.	Continuous exported supply metered flow class is logged automatically & reviewed each business day by the utility saling (expositing) the water. Data is adjusted to ornere gross are from detected meterinatumentation of the continuent traditionation and any surface accuracy testing. Any class recording to exposition of the process of the continuent and corrected on a day basis. A data art as easies for the process of protect both the selling (exporting) Utility and the putchasing Utility.	
th ter 20% 30% ad ad ad Conditions between ter 6 and 10 Advanced Materia ag af manual meter reading affirmation in the year turacy teating program. Tag or large scale meter unacy teating program. Tag or large scale meter unacy teating program. Tag or large scale meter annual detailed billing detailed annual detailed billing annual charled third parity auditing at three years.		If that all exported infirm that all exported death business Results of all meter should be available for purchasing Utility purchasing Utility wand updating of the agreements with the very five years.	Conditions between 8 and 10	The second name of the second	
Continue annual internal billing data auditing, and third party auditing at least every time of years. Continue the continue of the party auditing at least every time of years. Continue that accurately setting to ensure that accurately setting to ensure that accurate accurately earling as or basis for volume based billing. Silva at housest of improvements in Automatic Meter Reading (AMR) and Advanced Metering Inflastructure (AM) and a Information management. Plan and at budget of putelfied outgrades in metering, mater reading and billing data management or metiral in very little of the continue of t	At least 99% of customers exist with volume-based billing from meter reads. At least 95% customer meter reading success rate, grininum 80% netter reading success rate, grininum 80% netter reading success rate, grininum 80% netter reading success rate, with Automatic Meter Reading (AMR) or Advanced Metering Infrastructure (AMI) trails underway. Statistically significant customer meter testing and replacement program in place on a confinuous besite. Computerized stilling, including field investigation or representative sample of accounts understaken samp		to maintain 10: Monitor meter innovations for development of more accurate and fees expansive formersers; work with the purchasing utilities to help identify meter replacement research. Keep purchasing utilities to help identify, productive elections. Keep the writing the policities elections. Keep the writing agreement current with clear and explicit innurses that meets the ongoing needs of all parties.	Computerized system (SCADA or similar) automatically records data which is reviewed each business day by the utility selling (exporting) the water. Tight accountability controls ensure that its enror/data gaps that coour in the surhoved low data are quickly detected and corrected. A reliable data this exists and control provisions for meter testing and data management are reviewed by the selling Utility and purchasing Utility and ileast once every five years.	

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Unbilled unmetered:	improvements to attain higher data grading for "Unbilled Metered Consumption" component:	Unbilled metered:	Improvements to attain higher data grading for "Blad Unmatered Consumption" component:	Billed unmetered:	Grading >>>
		select nie if all billing- exempt consumption is unmeteed.		Select n/a if it is the policy of the water utility to meter all outstoner connections and it has been confirmed by detailed auding that all outstomers do indeed have a water meter; a no intentionally unmetered accounts exist.	n/a
Extent of unbilled, unmetered consumption is unknown due to unclear policies and poor recordesping. Total consumption is quantified based upon a purely subjective estimate.	to qualify/for 2. Reassess the water utility's policy along a data in accounts to the grande a billing evention. Date for an outline of a new written policy for billing eventpions, with clear billing eventpions, with clear billing eventpions to they not accounts a date of the highest one to very not accounts and who the intention to keep the number of such accounts to a minimum.	Billing practices exempt certain accounts, such as municipal buildings but written policities of and a relative part of the property of the pr	to qualify for 2. Conduct research and evaluate coatenate of the coatenate of a new water utility policy to require metering of the customer population; thereby greatly reducing or eliminating great accounts. Conduct pilot metering project by investion or coatenation water metes in small sample of customer accounts and pariodosily reading the waters or cataloging the waters or cataloging the value consumption over one, three, or consumption over one, three, or seven day periods.	Water utility policy does not require customer metring; fat or fixed fee billing is employed. Not data is collected on customer consumption. The only estimate of customer population realisable are derived from data settlination metroous using a wavege fauter count multiplied by number of connections, or smilar approach.	
Clear extent of unblised, unmetered consumption is unknown, but a number of events are randomly documented each year, confirming existence of such consumption, but without sufficient documentation to quantity an occurate estimate of the particular volume consumed.	to qualify for 4. Review historic written directives and policy documents allowing certain accounts to be thing-exempt. Craft an outline of a written polcy for little geomptions, ledly criteria that grants an exemption, ledly criteria that grants an exemption, with a goal of keeping this number of accounts to a millimum. Consider increasing the priority of reading maters on unbilled accounts at least amusly.	Billing practices exampt certain accounts, such as municipal buildings, but only eathered, dated writen directives exist to justify this practice. A reliable count of unblied melared accounts is unawaisable melared accounts in unwaisable melared accounts in unwaisable melared accounts in estimated water consumption for all unblied, melared accounts is estimated water of accounts and assigning the number of accounts and assigning consumption from actively biled accounts of same meter size.	Implement a new water utility policy requiring customer metering. Launch or expand plot metering study to include serveral different meter types, which will provide data for economic assessment of tall scale metering policins. Assess sites with access difficulties to device means to obtain water consumption volumes. Begin customer meter installation.	Water utility policy does not require customer modeling; that or fixed the billing is employed. Some metered billing is employed. Some metered accounts exist in parts of the system (pike trease or battict Metered Areas) with consumption read periodically or recorded on potable distillation, by priodic, Data from these seven day priodic, Data from these sample meters are used to lifet consumption. Site specific estimation methods are used for unusual buildings/water uses.	22
Conditions between 2 and 4	d policy documents g-exempt. Draft an swemptions, identify the goal of keeping that goal of keeping hmum. Consider meters on unbilled husily.	Conditions between 2 and 4	requiring customer requiring customer metering study to g. which will provide dufficulties to devise to devise to devise on volumes. Begin nation.	Conditions between 2 and 4	3
Extent of unbilled, unmetered consumption is partially known, and procedures exist to document certain events such as miscelaneous fire hydrant uses. Formulae is used to quantify the consumption from such events (time running mulpipled by typical flowrate, multipled by number of events).	<u>to qualify for 8</u> : Draft a new written policy regarding Ulling evemptions based upon consensus rideia allowing the occurrence. Assign resources to audit mater roots and billing records to obtain census of unbilled metered accounts. Gradually include a greater number of these metered accounts to the routes for regular meter reading.	Dated written procedures permit billing exemption for specific accounts, such as municipal properties, but are undear regarding certain other types of accounts. Meter reading is given low priority and is sporadic. Consumption is quantified from meter readings where available. The total number of unbilled, lumestered accounts must be estimated along with consumption withmes.	Refine policy and proedures to improve customer metering participation for all but solidly section as counts. Assign staff resources to review bliling records to Identity errant unmetered properties. Specify metering reside and funding requirements to install sufficient meters to significant reduce the number of unmetered accounts.	Water utility policy does require metering and volume based billing in general. However, a libraria amount of exemptions and alack of deathy written and communicated procedures result in up to 20% of the billed accounts believed to be unmetered by exemption; or the exemption of the exemption of customes remain unmetered accounts is intunded in the annual water audit, with no inappersion of individual unmetered.	4
Default value of 1.25% of system input volume in employed employed	g billing exemptions wing this occurrence. If a cocurrence is and billing record accounts. Gradually etered accounts to the reading.	Conditions between 4 and 6	ve customer melerin da cocunits. Assign ruds to identify errant ruds in graeds and funding in graeds and funding it accounts	Conditions between 4 and 6	5
Coherent policies exist for some forms of unbilled, unmetered consumption but ofthes avail closer evaluation. Reasonable recordisepting for the managed uses seists and ellowed, annual volumes to be quantified by inference, but unspectived uses are guessimated.	Communicate billing exemption policy throughout the organization and implement procedures that ensure proper account management. Conduct inspections of accounts confirmed in unbilled material estatus and varify that accurate meters exist and are scheduled for routine meter readings. Creatually increase the number of unbilled meteral accounts that are included in regular meter meteral accounts that are included in regular meter reading routes.	Written policies regarding billing exemptions exist but adherence in practice is questionable. Metering and meter resealing for municipal buildings is reliable but appradio for cher unblad metered accounts. Periodic auditing of such accounts is conducted. Water consemption in quantified directly from meter readings where evaluable, but the majority of the consumption is estimated.	Push to install customer meters on a full scale basis. Push to install customer meters on a full scale basis. Pathe metering policy and procedures to ensure that all accounts, including numbrical properties are designated for meters. Plan special efforts to address "hard-to-access" accounts, implement procedures to obtain a reliable consumption estimate for the remaining few immetered accounts awaiting meter installation.	Water utility policy does require metaling and volume based billing but established exemptions exist for a portion of secounts such as municipal buildings. As many as 15% of billed accounts are unmetered due to this examption or meter installation difficulties. Only a group estimate of annual consumption for all unmetered accounts is included in the annual water audit, with no inspection of individual unmetered accounts.	6
Conditions between 6 and 8	by throughout the st hat resure prope st hat resure prope ections of accounts and early that led for routine meter furber of unbilled in regular meter	Conditions between 6 and 8	a full scale basis. Is to ensure that all a service that a s	Conditions between e and 8	7
Clear policies and good recordkeeping exist for some uses (ex: water used in peliodic testing of unmetered fire connections). Unit of there uses (ex: mater used in peliodic testing of unmetered fire connections). Unit of the uses (ex: mascelinacous uses of fire hydratins) have fired overeight of the unit	Ensure that meter management (moter accuracy testing, meter replacement) and meter reading activities for unliked accounts are accorded the anne plotting so decounts. Establish ongoing annual auditing process to ensure that water consumption is reliably collected and provided to the plotting annual matter audit process.	Written policy identifies the types of accounts granted a bling exemption. Customer maker management and meter reading are considered ascendary priorites, but meter to compare the amount of the amount of the amount where the amount water and. High level auditing of billing records ensures that a reliable census of such accounts a reliable census of such accounts.	to qualify for 10: Continue customer refer installation throughout the service by area, with a goal to minimize unmerised accounts. Sustain the effort to investigate accounts with access difficulties, and devise means to install water maters or otherwise measure water consumption.	Water utility policy does require metering and volume based billing for all customer accounts. However, less than 5% of blade accounts renain unmetered because meter installation is hindred by unusual circumstances. The goal is to accounts, relable estimates of unmetered accounts. Relable estimates of conumption are obtained for these unmetered accounts as a especific estimation methods.	.8
Conditions between 8 and 10	ster accuracy tresting, gardyfes for unbilled fifty as billed accountilled fifty as billed account that to and provided to the coess to ensure that a provided to the coess.	Conditions between 8 and 10	houghout the service ed accounts. Sustain accounts officialise, and access difficulties, and or otherwise measure n.	Conditions between 8 and 10	9
Clear policies exist to identify permitted use of water in unblied, unmeliared fashion, with the intention of minimizing this type of consumption. Social records document each occurrence and consumption is quantified via formulae (time running multiplied by hybrid flow, multiplied by number of events) or use of temporary meles.	to maintain 10: Reassess the utility's philosophy in allowing any water uses to go "unilitied", it is possible to mater and till all accounts, even if the fee charged for water consumption is discounted or waived. Metering and billing all secounts ensures that water consumption is tracked and water waste from plumbing leaks is described and minimized.	Clearly written policy identifies the types of accounts given a billing exemption, with emphasis on keeping such accounts to a minimum. Customer meter management and meter reading for these accounts is given proper priority and is reliably conducted. Regular auding confirms this. Total water consumption for these accounts is also properly and the second of the season from reliable readings from accounts to taken from reliable readings from accounts.	to maintain 10. Continue to refine estimation methods for unmetiend consumption and explore means to establish metering, for as many billed remaining unmetered accounts as a contaming the second accounts as a contaminating of seatible.	Water utility policy does require metering and volume based billing for all customer accounts. Less than 2% of billed accounts are unmetered and exist because meter installation is hindered by unsual olicumstances. The po	10

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Customer metering inaccuracles:	Improvements to ettain higher data grading for "Unauthorized Consumption" component	Unauthorized consumption:		Improvements to attain higher data grading for "Unbilled Unmetered Consumption" component:	Grading >>>
select r/a only if the entire customer population is unmetered in such a case the volume entered and the such a case the volume entered case the volum					n/a
Customer meters exist, but with unoxpanized paper records on meters, no meter accuracy testing or meter repleament program for or meter repleament program for any size of retail meter. Metering workflow is driven charcleslly with no pracerity emanagement. Loss volume due to aggregate meter inaccuracy is guessafimated.	to quality for 5. the eccel default of 0.2% of volume of water supplied to quality for 2. Review in the quality for 2. Review into quality for againing what water uses are considered unauthorized, and consider tracking a small sample of one such occurrence (ex. unauthorized file hydrant openings)	Extent of unauthorized consumption is unknown due to underspring and poor recordisesping. Total unauthorized consumption is guessimated.		to qualify for 5: Usilize the accepted default value of 1,25% of the volume of water supplied as an expedient means to gian a reasonable quantification of the true. The true the true and the true water uses should be allowed to remain as unbilled and unmedied. Consider tracking a small sample of one such tase from the fee for the true the true that the fee for the fee for the true that the fee for the fee for the true that the fee for the true that the fee fee fee feet and the feet feet feet feet feet feet feet	-
Poor recordiseoping and meter overeight is recognized by valet sulfit management who has allotted support records gathered and organized to provide cursory disposition of meter population. Customer means are tested for accuracy only upon customer request.	<u>to qualify for 5</u> Use accepted default of 0.25% of system input volume to qualify for 1.25% of system input volume to qualify for 1.25% of system provided the formation of the provided for the formation of the provided formation of the provided formation of the provided fire hydrant openings)	Unauthorized consumption is a known occurrence but its adent is a mystey. There are no forquiements to document observed events, but periodic field reports appure some of these occurrences. Total unauthorized consumption is approximated from this limited data.		Utilize accepted default value of 1,35% of the volume of water supplied as an expedient means to gain a reasonable quantification of this use. Louistiff Lot 2, auditiff Lot 2	N
Conditions between 2 and 4	stem input volume twater uses and det tracking a small unauthorizad fire	conditions between 2 and 4		% of the volume of aneans to gain a fittle use. This use. To first hydrants - continue been could in their need contain their need from the hydrants - from fire hydrants).	3
Reliable recordkeeping exists, meter information is improving as meters are replaced. Meter accuracy testing is conducted annually for a small number of meters (more than just customer requests, but less than 1% of inventopy). A limited number of the oldest meters are replaced early earl, inaccuracy volume is largely an estimate, but refined based upon limited teating refined based upon limited teating than the control of the oldest meters.	to qualify for 5: Utilize accepted default value of 0.25% of volume of water supplied as an expendent means to gain a sea en expendent means to gain a reasonable quantification of all such use. This is particularly appropriate for water utilize who are in the early stagges of the water auditing process.	Procedures exist to document some unauthorized consumption such as observed unauthorized fire hydrant oberings. Use formulate to quantify this consumption (time unning multiplied byoical flowrate, multiplied by number of events).	APPARENT LOSSES	to qualify for 5: Utilize accepted default value of 1.25% of the volume of water suppled as an expedient means to gain a reasonable quantification of all such use. This is particularly appropriate for water utilities who are no other components since the volume of unballed, unmattered on unitary process, and should focus on other components since the volume of unballed, unmattered consumption is usually a relatively small quantity components and other larger-quantity components about larger-quantity components about	4
Conditions between 4 and 6	to qualify for 6 or greater. Finalize policy underest to clearly identify the types of water consumption that are authorized that are authorized that from those usages that fall outside of the policy and are, therefore, unauthorized. Begin to conduct regular field checks. Frocead if the top-down audit already exists and/or a great volume of such ase is suspected.	Default value of 0.25% of volume of water supplied is employed	LOSSES	to qualify for 6 or greater. Finalize policy and begin to conduct aid begin to conduct aid checks to better establish and quantify such usage. Proceed if op-down audit exists and/or such use is suspected.	5
A reliable electronic recordkeeping system for meters exists. The meter population includes a mix of new highest nictudes as a mix of new high suspect sociatory. Routline, but minted, meter securacy Restine, but minted, meter securacy testing and meter replacement occur. Insecuracy volume is quantified using a mix of reliable and less certain data.	Assess water utility policies to ensure that all known cocurrences of unauthorized consumption are outlawed, and that appropriate penalties are prescribed. Create written procedures for detection and documentation of various occurrences of unauthorized consumption as they are uncoveried.	Coherent policies exist for some forms of unauthorized consumption (more than simply file hydrant misuse) but others await closer evaluation. Reasonable survisilance and that fall under the policy. Volumes quantitied by inference from these quantities of the policy. Volumes the policy.		to qualify for 8: Assess water utility policy and procedures for various ummetered usages. For example, ensure that a policy axists and permits are issued for use of the hydrants by persons outside of the utility. Create written procedures for use and documentation of the hydrants by water utility personned. Use same approach for other types of unbilled, ummetered water usage.	6
Conditions between 6 and 8	re that al known plan are contained for an outlawed, searched. Ches documentation of communities at they consumption as they consumption as they	Conditions between 6 and 8		dures for various for various and policy of fire hydrants by offer hydrants by the firethen procedures for that by water utility her types of unbilled.	7
Ongoing meter replacement and accuracy testing result in highly accuracy testing result in population. Testing is conducted on samples of matters of varying age and accurated volume of throughput to determine optimum replacement time for various types of meters.	to quelify for 10: Refine written procedures and assign staff to seek out likely occurrences of unauthorized consumption. Explore new locking devices, moritizes and their technologies designed to detect and thwart unauthorized consumption.	Clear policies and good auditable recordkeeping exist for certain events (ex: tampering with venter meters, lifegal bypasses of customer meters), but other occurrences have limited oversight. Total consumption is a combination of volumes from formulae (time x typical flow) and subjective estimates of unconfirmed consumption.		lousily by 10: Refine written procedures to ensure that all uses of unbilled unmakered water are overseen by a situatured permitting process managed by water utility personnet. Reassess polity to determine it some of these uses have value in being converted to billed and/or metered status.	8
Ongoing meter replacement and accuracy testing result in highly accurate and in highly accurate accuracy testing result in highly accurate meter population. Statistically significant number of meters are tested in audy say. This testing is conducted on accorducted on accorducted or accord	; staff to seek out fikely retaff to seek out fikely replant. Explore new chnologies designed to d consumption.	Conditions between 8 and 10		hat all uses of unbilled, structured permitting ormel. Reassess policy have value in being etered status.	9
Good records of all active customer meters exist and include as a minimum: meter number, account number, account number location, type, size and manufacturer. Orgading meter replacement occurs according to a targeted and justified beats. Regular meter accuracy testing gives a reliable measure of composite inaccuracy volume for the customer meter population. New metering exchange is embraced to keep overal accuracy is embraced to keep overal accuracy in more overal accuracy in the meter of the customer meter population. The customer meter population is an existence of the customer meter operation of the customer meter of the customer meter operation. The customer meter of the customer meter of the customer meters of the custom	to maintain 10: Continue to refine policy and procedures to eliminate any loopholes that allow or tacilly encourage unauthorized consumption. Continue to be vigilant in describon, documentation and enforcement efforts.	Clear policies exist to identify all known unauthorized uses of water. Staff and procedures exist to provide enforcement of policies and detect violations. Each occurrence is recorded and quantified via formating with the centimeted time running multiplied by hybrid flow) or similar methods. All records and calculations should dexist in a form that can be audited by a third as form that can be audited by a third		to maintain 10: Continue to refine policy and Continue to refine policy and proedures with intention of reducing the number of allowable uses of writer in unbilled and unmerced fashion. Any uses that can resulty become billed and metered should be converted eventually.	10

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Improvements to attain higher data grading for "Length of Water Mains" component	Length of mains:		Improvements to attain higher data grading for "Systematic Deta Handling Error volume" component:	Systematic Data Handling Errors:	Improvements to attain higher data grading for "Customer meter inaccusery volume" component:	Grading >>>
				Note: all water utilities inour some amount of this error. Even in water utilities with unmetered customer populations and their draft billing, errors occur in annual billing tabulations. Enter a positive value for the volume and select a grading.	If n/a is selected because the customer meter population is unmetered, consider establishing a new policy to meter the customer population and employ water rates based upon metered volumes.	n/a
Assign paracrime to inventory current as-bult records and compare with customer obligation of the very plans in order to verify posture with customer obligation of the very plans. Assemble policy documented to verify poorly documented periodicy documented in particular productions. Assemble policy documents regarding permitting and documentation of verter main installations by the utility and building developers, identify appear in procedures that result in poor documentation or flore water main installations.	Ponly assembled and maintained paper as-built records of decirity water main netalizations makes accurate determination of system pite ingrit impossible. Length of mains is guessimated.		to qualify for 2. Dat written policy and procedures for excharing new water billing accounts and overaging of the properties of the prope	Policies and procedures for activation of new customer water billing accounts are vigue and lack accountability. Billing data is are not well organized. No auditory is conducted to confirm billing data is in a contracted to confirm billing data in the confirm billing data is in conducted to confirm billing data in confirmation billing dat	to qualify for 2. Gather evaliable mater purchase records. Conduct testing on a small number of meter believed to be the most inaccurate. Review staffing needs of the metering grup and budget for necessary resucces to better organize meter management.	1
to qualify for 4: Complete inventory of paper records of water main installations for several years pilor to audit year. Review policy and procedures for commissioning and documenting new water main installation.	Paper records in poor or uncertain condition for annual tracking of installations is abandomentally installations in sandomentally water mains installed by developer water mains installed by developers are accurately documented.		<u>to quality for 4.</u> Finalize written policy and procedures for activation of new hilling accounts and overall hilling operations management, implement a computezed outstormer hilling system. Conduct initial audit of talling records as part of this process.	Policy and procedures for activation of new customer accounts and oversight of billing decords exist but need reference. Billing data manufacted for paper records or insufficiently capable sectorion database. Only periodic unstructured auditing work is conducted to confirm billing data handling afficiency. The volume of unbilled water due to billing lapses is a guess.	to qualify for d. Implement a reliable record keeping system for customer meter histories, preferably using electronic methods byposity intel to, or part of, the clustomer Billing System or Customer information System. Expand meter accuracy testing to a larger group of meters.	22
rds of water main audit year. Review missioning and i Installation.	Conditions between 2 and 4		es for activation of izled customer billing operations great order as part of	Conditions between 2 and 4	ysiem for customer ectronic methods omer Billing System Expand meter up of meters.	s
to quality for 6: Finalize updates/improvements to written policy and procedures for permitting/commissioning new main installations. Confirm inventory of records for five years prior to audit year; correct any errors or omissions.	Sound written policy and procedures exist for documenting new water in main installations, but gape in management result in a uncertain degree of error in babulation of mains length.	SYSTEM DATA	Refine new account advation and billing operations procedures and ensure consistency with the utility policy regarding billing, and minimize opportunity for missed p billings. Ungraded or replace uterioner billing adjustments don't nesded functionally - ensure that billing adjustments don't conrugit the value of consumption volumes. Procedurize Internal annual audit process.	Policy and procedures for new account activation and overeight of billing operations easist but needs reflected to computative design of the season of the s	to qualify for @: Shandardize the procedures for meter recontikeeping within an electronic information system. Accelerate meter accuracy testing and meter replacements guided by testing results.	4
o written policy and issioning new main records for five years trots or omissions.	Conditions between 4 and 6	DATA	id biling operations y with the utility policy portunity for missed mer biling system for fing adjustments don olunes. Procedurizs process.	Conditions between 4 and 6	r recordkeeping within Accelerate mater and guided by feetin	O1
<u>to quality for 8</u> Launch random field checks of limited number of locations. Convert to electronic database such as a Geographic information System (GIS) with backup as justified. Develop written policy and procedures.	Sound written policy and procedures axist for permitting and commissioning new water mains. Highly accurate paper records with regular field validation; or electronic records and asset management system in good condition, includes system backup.		to qualify for 8. Formalize regular review of new account achivation process and general billing practices. Enhance reporting capability of computerized billing system. Formalize regular auditing process to reveal scope of data handling error. Pain for periods third parry audits to court at least once every five years.	Policy and procedures for new account activation and oversight of billing operations is adequate and its adequate and its interviewed periodically. Computerized billing ayram is in use with basic reporting available. Any effect of billing adjustments on measured billing adjustments on measured by adjustment other of billing data error conducted amounts, and the consumption volume lost to billing onsumption volume lost to billing lapses is obtained.	to qualify for 8: Expand annual meter accuracy teating to evaluate a statistically significant number of meter mater analest/models, a Expand meter replacement program to replace statistically significant number of poor performing meters each year.	6
number of locations as a Geographic as a Leographic as justified. Develor durse.	Conditions between 6 and 8		nt activation proces e reporting capabilit alize regular auditing ilting error. Plan for east once every five	Conditions between 6 and 8	ting to evaluate a far makes/models. The makes/models are paleace statistically a meters each year.	7
to quality for 10: Link Geographic into mation System (GIS) and asset management databasea, conduct fed verification of data. P Record field verification information at least annually.	Sound written policy and procedures exist for permitting and commissioning new vater mains. If Electronic recordisesing use has commissioning and commissioning recording to the commission for the coordinate of		to quality for 10. Close policy/procedure loopholes that allow some customer accounts to go unblied, or data handling errors to exist. Ensure that bling system reports are utilized, amblyade and reported every billing cycle. Ensure that inframal and third party audits are conducted at least once every three years.	New account activation and billing perations policy and procedures are reviewed at least bannually. Computerized billing system including system including system including system including chairs and system functionally. Chacks are conducted routinely to accounts, Annual internal checks conducted with including sudit onducted with including system. Consumption lost billing lapses. Consumption lost billing lapses is well quantified and reducing yearl-by-year.	to qualty for 9: Commus efforts to manage meter population with reliable recordisepting. Treat a studistically significant number of metase each year and snalyze test results in an ongoing manner to serve as a benderment for a target meter replacement strategy based upon accumulated yolume throughput.	8
Q: ield wriffication of data. Ion at least annually.	Conditions between 8 and 10	-	Q. last allow some customs anding errors to exist. e utilized, analyzed and a that internal and that once every three years.	Conditions between 8 and 10	to qualify for 10: Continue efforts to manage meter population with relation recordiscepting, meter teating and replacement. Evaluate new meter types and install on 5-10 customer accounts palociting order to pilot improving metering technology.	9
to maintain 10 Continue with standardization and random field validation to improve the completeness and accuracy of the system.	Sound written policy edets for managing water mains extensions and replacements, Geographic information System (GIS) data and asset management database agree and random field validation proves furth or databases. Records of annual field validation should be available for review.		to maintain 10. Stay abreast of customer information management developments and management developments of developments of Advanced Metering Infrastructure (AM) and integrate technology to ensure that customer endophint information is well-monitored and errora/lippees are at an economic minimum.	Sound written policy and procedures axist for new account activation and oversight of custome billing operations. Robust computative dibilling system gives high functionality and traporting appabilities which are notifized, employed and the results reported each billing pyes. Assessment of policy and data handling enons are conducted internally and audited by hirth graphy at least once every three years, ensuring consumption betto billing leases is minimized and detected as it occurs.	to maintain 10. Increase the number of meters tested ate and replaced as justified by meter accuracy test data. Continually monitor development of new metering technology and Advanced Matering Infrastructure (AMI) to gresp opportunities for greater accuracy in metering of water flow and management of customer consumption data.	10

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Average operating pressure:	Improvements to attain higher data grading for "Average Length of Customer Sarvice Line" component:	Average length of customer service line:		Improvements to attain higher data greating for "Number of Active and inactive Service Connections" component	Number of active AND inactive service connections:	Grading >>>
		meters are located outside of the customer building next to the outside stop or boundary separating utility/customer responsibility, then the auditor should answer "yes" to the question on the Reporting Whorksheet asking about this. If the answer is Yes, the grading description istand under the Grading of 10(a) will be followed, with a value of zero automatically intered at a Grading of 10. See the Service Connection Diagram worksheet for a visual presentation of this distance.	Note: if customer water	Note: The number of Service Connections does <u>not</u> include fire hydrant leads/lines connecting the hydrant to the water main		n/a
Available records are poorly assembled and maintained paper records of supply pump characteristics and variety characteristics and variety distribution system noperating guessimated based upon this information and ground devalors. The prographical reage years and the prographical reage will be provided to pographical reage. Widely varying distribution system pressures due to including ferrain, by system these force and weakferraic pressure compromise the validity of the average pressure calculation.	to qualify for 2: Research and collect paper records of service line installations. Inspect service line installations. Inspect service line installations in spect ocations to locate out schoe. Obtain the length of this small sample of connections in this sample of manner.	Vague policy exists to define the delineation of water utility ownership and customer ownership of the service connection ploing. Curb stope are preceived as the treational properties of the properties of the properties of decumented the properties of the properties and estimating this distance is a citizeny due to the unknown location or many curb stops.	Gradings 1-9 apply if customer pro- these cases the average distance by	to quality for 2 Draft new policy and procedures for new account activation and owered within a periations. Research and oblight peper records of installations delect peper records of installations & abandonnesis for several years & abandonnesis for several years.	Vague permitting (of new service connections) policy and poor paper recordesping of customer connectionabilings result in suspect determination of the number of service connections, which may be 10-15% in error from actual count.	1
Limited telemetry monitoring of scattered jumping stellon and vivites active provides come static pressure data, which is static pressure data, which is recorded in handwritten logbooks. Pressure data is gaintered at individual sites only when low pressure complaints arise. Averaging pressure is determined by averaging teleby crude data, and is affected by significant variation in ground devalors, system head loss and gaps in pressure controls in the distribution system.	In quality for 4: Formalize and communicate policy delineating utility/customer responsibilities for service connection piping. Assess socurary of paper records by field inspection of a small service connections service inspection of a small service of information management as needed. Research the potential important as computatived information management system to store service connection data.	Policy requires that the curb stop serves as the delineation point between water utility connection print customer connection piping. The piping from the water main to the auto stop in the piping from the customer building is connected building is connected to piping. The piping from the piping from the curb stop to the piping from the curb stop to the customer. Curb stop locations are not was documented and the average distance is based upon a limited number of locations measured in the field.	perties are unmetered, if customer me eween the curb stop or boundary sep	to qualify/for.4; Refine policy and pocedures for new account activation and overall billing operations. Research computerized recordseaping system (Customer Information System) to improve documentation Customer Billing System) to improve documentation format for service connections.	General permitting policy exists but paper records, procedural gaps and weak oversight result in questionable total for number of connections, which may vary 5-10% connections, which may vary 5-10% of actual count.	2
Conditions between 2 and 4	service connection service connection or records by field connections using treatment the potential setion management rection data.	Conditions between 2 and 4	aters exist and are loc parating utility/custom	w account activation arch computerized formation System or formation System or expended actions.	Conditions between 2 and 4	3
Effective pressure controls separate different pressure zones; moderate pressure variation across the pressure variation across the pressure variation across the pressure consideration of the distribution speak pressure across the control pressure across distribution speak pressure data electronically. Pressure data grained by gauge or datalogate at fire hydrants or distribution speak pressure data electronically. Pressure data electronically complete across the distribution of the data or datalogate across the distribution of the data complete across the distribution of the flow tests and system flushing. Reliable topographical data exists. Aversage pressure is calculated using this mix	to quality for 8: Establish coherent procedures to ensure that policy for curb stop, meter installation and documentation is followed. Gain consensus within the water utility for the establishment of a computatized information management system.	Good policy requires that the curb stop serves as the delineation point between water utility ownership and customer ownership of the service connection points. Curb stops are generally installed as needed and are reasonably documented. Their location varies widely from site-points, and an estimate of this distance is inhefered by the availability of paper records of limited accuracy,	ated inside the customer building prer er responsibility for service connection means to quantify this value. (See	to qualify for 8. Refine procedures to ensure consistency with new account activation and overall billing policy to establish new service connections or decommission existing connections. Improve process to include all traders at least five years prior to audit year.	Written account activation policy and procedures exist, but with some gaps in performance and oversight. Computarized information management system is being brought online to replace dated paper recordiceping system. Research by accurate tracking of service connection installations described connection installations described connection installations described connection installations described connections.	4
Conditions between 4 and 6	ure that policy for curl antation is followed. If you the establishmen anagement system.	Conditions between 4 and 6	ises, or if the water ut piping, and the typical the "Service Connect	establish new account establish new service isting connections. for at least five years	Conditions between 4 and 6	5
Reliable pressure controls separate classificit pressure zones, only very occasional poen boundary velves en countriery charter and contradity charter and contradity. Pressure pressure data dectronizally. Pressure gentered by gaugeschatinoges when low pressure complaints arise, and during when low pressure complaints arise, and during the property complaints arise, and during the pressure complaints are an arise and during the pressure complaints are arise and during the pressure complaints are arise and during the pressure arise and during the pressure arise and during the pressure arise and during the	to qualify for 8: Implement an electronic means of recordkeeping, typically like a customer billing means of according to the control of the control of the customer billing system, or Geographic information System (GIS). Standardze the process to conduct field checks of a limited number of locations.	Clear written policy exists to define utility/customer responsibility for service connection plping. Accurate, well-maintained paper or basic electronic recordisegring system exists. Periodic field checks comfirm plping lengths for a sample of pustomer properties.	Gradings 1-9 apply if customer properties are unmetered, if customer meters exist and are located inside the customer building premises, or if the value utility owns and is responsible for the entire service connection piping from the water main to the customer meter must be quantified. Gradings of 1-9 are used to grade the validity of the these cases the average distance between the curb stop or boundary separating utility/customer responsibility for service connection piping, and the typical first point of use (ex: faucet) or the customer meter must be quantified. Gradings of 1-9 are used to grade the validity of the means to quantify this value. (See the "Service Connection Diagram" worksheet)	to qualify for 8: Formalize regular releve of new account activation and overall billing operations policies and procedures, Launch random field checks of imited number of locations. Develop reports and sudding mechanisms for computerized information management system.	Written new account activation and overall billing policies and procedures are adequate and reviewed periodically. Computerized information management system is in use with annual installation. As beandonners totaled. Yery limited field writingstorns and audits. Error in count of funder of service connections is believed to be no more connections.	6
Conditions between 6 and 8	ordkeeping, typically tomer billing system (S), Standardize the Ilmited number of	Conditions between 6 and 8	service connection mer meter must be o	ount activation and rocedures. Launch tocadures. Launch ober of locations. softenisms for sement system.	Conditions between 6 and 8	7
Well-managed, discrete pressure zones exist with generally predictable pressure fluctations. A current rite pressure fluctations. A current rite pressure fluctations. A current rite pressure monitoring system exists of monitor the vater distribution system and collect data, including real time pressure readings at representations the system. The average system pressure is determined from reliable monitoring system data.	<u>to quality for 10;</u> Link oustomer information management system and Geographic information System (Stell), standardize process for field verification of data.	Clearly worded policy standardizes the location of curb stops and meters, which are inspected upon installation. Accurate and well maintained electronic records a visit with periodic fled checks to confirm locations at general customer meter piles. An accurate number of customer properties from the customer billings. An accurate the customer billings yestem allows for reliable averaging of this length.	oiping from the water main to the custon quantified. Gradings of 1-9 are used to p	<u>to qualify for 10</u> . Clees any procedural toopholes that allow installations to go undocumented. Link compruterized information management system with Geographic information Systems (GSIs) and (formation system auditing processes. Documentation of two or decommissioned processes. Documentation of two or decommissioned service connections encounters serveral levels of checks and balances.	Policies and procedures for new account advastion and overall billing operations are written, well-structured and reviewed at least biannually. Weis managed computerized information management system exists and routine, periodic field checks and internal system audits are conducted. Counts of connections are no more than 2% in error.	8
Conditions between 8 and 10	ement system and I, standardize process data,	Conditions between 8 and 10	ner building. In any of rade the validity of the	illow installations to go formation management 1. System (GIS) and ston system auditing or decommissioned at levels of checks and	Conditions between 8 and 10	9
Well-managed pressure districts/zones, SCALA System and hydratis model south to pie very precise pressure data across the water distribution system. Average system pressure is reliably calculated from extensive, reliable, and cross-checked data. Zelutations are reported on an annual bassis as a minimum.	to maintain 10: Continue with stenderdization and random field relication to improve knowledge of service connection configurations and customer meter boattons.	a) Quatorne water melere sede outside of custome buildings nead to the out of custome buildings nead to the out of custome buildings nead to the outside of custome responsibility for services connection pring. I be, answer "see you have been to the question on the Reporting to the question on the Reporting Working asking about this condition. A value of zero end a Grading of 10 are automatically entered in the Reporting Workeheat, who was the customer Workeheat, and we will be customer with the customer of the customer o	Either of two conditions can be met for a grading of 10:	t <u>Iomaintain 10</u> Continue with standardzeiton and random field-vaildation to improve knowledge of system.	Sound written policy and wall managed and audited procedures ensure reliable management of service connection population. Computerzed information management system, Custoner Bling System and Geographic Information agree; field validation protes truth of databases. Count of connections recorded as being in error is less than '% of the entire population."	10

time pressure data calibration, and	tem
linking it with SCADA System for real-	9
	een
from Continue to refine the hydraulic model	from
to maintain 10:	

Improvements to attain higher data grading for "Average Operating Pressure" component:	Grading >>>
	n/a
to qualify for 2: Employ pressure gauging andor delections equipment to obtain pressure measurements from fire hydrents. Locate accurate topographical maps of service area in order to confirm ground elevations. Research pump data sheets to find pump pressurations of host of the pressurations of the pre	-
Formalize a procedure to use pressure gauging/datalogging equipment to gather pressure and ouring various system events earn has low pressure and flow data at different flow regimes. Identify allow the pressure controls (pressure actioning valves, affitude valves, partially poen boundary valves) and plan to poperly profigure pressure zones. Make ell pressure settlude valves, partially open boundary valves) and plan to properly pressure controls (pressure reducing valves, affitude valves, partially open boundary valves) and plan to properly profigure of pressure zones. Make ell pressure dataset from these efforts available to ganerate system-wide pressure dataset from these efforts available to ganerate system-wide pressure dataset from these efforts available to ganerate system-wide pressure dataset from these efforts available to ganerate system-wide pressure dataset from these efforts available to ganerate system-wide pressure dataset from these efforts are available to ganerate system-wide pressure dataset from these efforts are available to ganerate system-wide pressure dataset from these efforts are available to ganerate system-wide pressure dataset from these efforts are available to ganerate system-wide pressure dataset from these efforts are available to ganerate system-wide pressure dataset from the second pressure available to ganerate system-wide pressure dataset from these efforts are available to ganerate system-wide pressure dataset from the second pressure available to ganerate system-wide pressure dataset from the second pressure available to ganerate system-wide pressure dataset from the second pressure available to ganerate system-wide pressure dataset from the second pressure available to ganerate system-wide pressure dataset from the second	2
pressure ther pressure data ther pressure as low pressure as low pressure ther pump pressure as, Identify faulty g valves, affitude yes) and plan to Make all pressure merate system-wide	ဒ
Expand the use of pressure gauging datalogging gauging datalogging equipment to gather pressure and uning various system reverse units as low pressure and the use of pressure data at a quin'ng various system reverse units as low pressure compaints, or operational testing. Cather pump pressure and flow data at different flow regimes. Identify fault pressure controls (pressure reducing various, partially open boundary various) and pressure controls (pressure and one) properly configure pressure zones. Marke all pressure experience on the configuration of the configuration	4
jing/datalogging easure date at a easure date at a n pressure zones or w data to determine re zone or district. (pressure reducing (pressure reducing boundary valves) to ones. Use expanded to generate system-tre.	O
instal a Superisory Contain of the Acquisition (SCADA) Instal a Superisory Control and Data Acquisition (SCADA) System or similar reading entering system, to monitor system parameters and control operations. Ser regular callustion expected for installmentation, to install a course, Obtain accurate topographical data and utiliza pressure data garbased from field surreys to provide pressure data patheed at the prographical data and utiliza pressure data and utiliza pressure data and utiliza pressure data in the surreys to provide systems and the surreys and the surreys of	6
ocquisition (SCADA) system, to monitor tions. Set regular on to insure data con to insure data resisto provide irreys to provide ire averaging.	7
to qualify for 8. In qualify for 8. In qualify for 8. In qualify for 10. In qualif	8
pressure value from yetem that has been ne water distribution with SCADA System	9
Install a Supervisory Control and Data Acquisition (SCADA) System, or similar realtime monitoring system, to monitor System or similar realtime monitoring system, to monitor Amusily, obtain a system-wide superpersure value from system and considered in calibration system and considered in control operations. Sat regular the hydraulic model of the distribution system and considered calibration or system and considered in control of the distribution syst	10

Improvements to attain higher data grading for "Variable Production Cost" component	Variable production cost (applied to Real Losses):	Improvements to attain higher data grading for "Customer Retail Unit Cost" component:	Customer retail unit coet (applied to Apparent Losses):	Improvements to attain higher data grading for "Total Annual Cost of Operating the Water System" component.	Total annual cost of operating water system:		Grading >>>
	Note: if the water utility purchased imports its entire water supply, then enter the unit purchased cost of the bulk water supply in the Reporting supply in the Reporting Viorisenes with a grading of 10		Customer population unmetered, ancidor only a fixed fee is charged for consumption.				n/a
to qualify for 2: Gather available records, institute new procedures to regularly collect and audit basic cost data and most important operations functions.	Incomplete paper records and lack of documentation on primary operating functions (learning to produce the carbon power and readment costs most importantly) makes calculation of variable production costs a pure guessimate	to qualify for 2: Formalize the process to implement water rates, including a secure documentation processive. Create a current, formal water rate document and gain approval from all stakeholders.	Antiquated, cumbenome water rate structure is used, with periodic historic amendments that ware poorly documented and implemented; resulting in classes of customers being billed inconsistent charges. The actual composite billing rate likely driver significant, but a face the published water rate structure, but a face of auditing leaves the degree of error indeterminate.	to quality for 2: Gather available records, institute new financial accounting procedures to regularly collect and audit basic cost data of most important operations functions.	incomplete paper records and lack of financial accounting documentation on many operating functions makes calculation of water system operating costs a pure guesstimate		-1
to qualify for 4: Implement an electronic cost accounting system, structured according to accounting standards for water utilities	Reasonably maintained, but incomplete, paper or electronic accounting provides data to rought estimate the basic operations costs and treatment costs and or calculate a unit variable production cost.	to quality for 4: Review the water rate structure and u potate/formalize as needed. Assess billing operations to ensure that actual billing operations incorporate the established water rate structure.	Dated, cumbersome water rate structure, not always employed consistently in actual billing operations. The actual composite billing rate is known to differ from the published water rate structure, and a reasonably accurate estimate of the degree of error is determined, allowing a composite billing rate to be quantified.	to qualify for 4: Implement an electronic cost accounting system, structured according to accounting standards for water utilities.	Reasonably maintained, but incomplete, paper or electronic accounting provides data to estimate the major portion of water system operating costs.		2
counting system, standards for water	Conditions between 2 and 4	update/formalize as onsure that actual tablished water rate	Conditions between 2 and 4	ounting system, standards for water	Conditions between 2 and 4		3
to qualify for 8 Formalize process for regular internal audits of production costs. Assess whether additional costs (fability, residuals management, equipment year, impending infrastructure expansion) should be included to calculate a more representative variable production cost.	Electronic, inclusity-standard cost accounting system in place. Electric power and treatment costs are reliably tracked and allow accounting with tracked and allow account wighted calculation of unit variable production costs based on these who inputs and water imported purchase costs (if applicables). All costs are audited internally on a periodic basis.	to quality for 8. Evaluate volume of water used in sean usage block by residential users. Multiply volumes by full rate structure.	Straight-forward water rate structure in use, but not updated in several years. Billing operations reliably earning the structure. The employ the rate structure. The composate billing rate is derived from a single customer class such as residential customer accounts, neglecting the effect of different rates from varying customer classes.	Estableb process for periodic internal audit of water system operating costs; (dentify cost data gaps and institute procedures for tracking these outstanding costs.	Electroic, industry-standard cost accounting system in place. However, paps in data are known to exist, periodic infamila leviews a conducted but not a structured conducted but not a structured description.	COST DATA	4
), al audits of production osts (liability, residuals pending infrastructure to calculate a more duction cost.	Conditions between 4 and 6	Leunch effort to fully meter the customer population and charge rates based upon water volumes	Conditions between 4 and 6	gl audit of water systen a gaps and institute outstanding costs.	Conditions between 4 and 6	DATA	51
to <u>outsift for 8</u> : Formalize the accounting process to include direct cost components (power, treatment) as well as indirect cost components (absilty, residuals management, etc.). Arrangle to conduct sudds by a knowledgeable third-party at least once every three years.	Reliable electronic, industry-standard cost accounting system in place, with a partitional variety of the partition of the pa	to qualify for 8: Evaluate volume of water used in each usege block by all classifications of users. Multiply volumes by full rate structure.	Clearly written, up-to-date water rate structure is in force and is applied relably in billing operations. Composite customer rate is determined using a weighted average residential rate using a weighted average in each rate block.	to qualify for 8; Standardize the process to conduct routine financial audit on an annual basis. Arrange for CPA audit of financial records at least once every three years.	Reliable electronic inclustry-standard cost accounting system in place, with all perfinent water system operating costs tracted. Data suitled periodically by utility personnel, but not a Centified Public Accountant (CPA).		6
include direct cost vell as indirect cost sment, etc.) Arrangs e third-party at least irs.	Conditions between 6 and 8	h usage block by all lumes by full rate	Conditions between 6 and 8	outine financial audit A audit of financial hree years.	Conditions between 6 and 8		7
to qualify for 10: Standardize the process to conduct at third-party financial audit by a CPA on an annual basis.	Reliable electronic, industry-standard coots accounting system in place, with all perferent primary and secondary variable production and water imported purchase (if applicable) costs tracked. The data is sudded least annually by utility personnel, and at least once every three years by a third-pary knowledgeable in the M36 methodology.	to qualify for 10; Conduct a periode third-party audit of water used in each usage block by all classifications of users. Multiply volumes by full rate structure.	Effective water rate structure is in force and is applied reliably in bling operations. Composite customer rate is determined using a weighted a weighted naverage composite consumption rate. Which includes residential, commercial, industrial, institutional (CII), and any other distinct customer classes within the water rate attructure.	to qualify(cr.10). Standardize the process to conduct a bird-party financial audit by a CPA on an annual basis.	Reliable electronic, industry-standard cost accounting system in place, with all periment water system operating costs tracked. Data audied at least annual by utility presonnet, and at least once every three years by third-pathy CPA.		8
a third-party financial ual basis.	Conditions between 8 and 10	y water used in each lers. Multiply volumes 'e.	Conditions between 8 and 10	a third-party finandal wal basis.	Conditions between 8 and 10		9
to maintain 10: Maintain program, stay abreast of expenses subject to erable cost changes and budget/track costs preactively	Either of two conditions can be met to obtain a grafing of 10: 1) Third party CPA audit of all perfinent primary and secondary variable production and water imported production and water imported purchase (if applicable) costs on an analysis of the production and basis. Of: 2) Water supply is entirely purchased as bulk imported water, and unit purchase cost serves as the variable purchase production cost.	to maintain 10: Keep water rate structure current in addressing the water utility a revenue needs. Update the calculation of the customer utilit rate as new rate customer utilit rate as new rate components, customer classes, or other components are modified.	Current, effective water rate structure is in force and applied reliably in billing operations. The rate structure and calculations of composite rate - which includes residential, commercial, industrial, institutional (CII), and other distinct customer classes - are reviewed by a third parity knowledgastion in the MSG knowledgastion in the MSG methodology at least once every five years.	to naintain 10: Maintain program, stay abreast of expenses subject to arratic cost changes and long-term cost trend, and budgebhack costs proactively	Reliable electronic, industry-standard cost accounting system in place, with a significant cost accounting system perains; on the perains; costs tracked. Data audited annually by utility personnel and annually also by third-party CPA.		10

Water Audit Report for: City of Los Banos (2410005) 2019 1/2019 - 12/2019 54 Data Validity Score: Reporting Year:

		Water Loss Con	Water Loss Control Planning Guide	de	
		Water /	Water Audit Data Validity Level / Score	/ Score	
Functional Focus Area	Level I (0-25)	Level II (26-50)	Level III (51-70)	Level IV (71-90)	Level V (91-100)
Audit Data Collection	Launch auditing and loss control team; address production metering deficiencies	Analyze business process for customer metering and billing functions and water supply operations. Identify data gaps.	Establish/revise policies and procedures for data collection	Refine data collection practices and establish as routine business process	Annual water audit is a reliable gauge of year-to-year water efficiency standing
Short-term loss control	Research information on leak detection programs. Begin flowcharting analysis of customer billing system	Conduct loss assessment investigations on a sample portion of the system: customer meter testing, leak survey, unauthorized consumption, etc.	Establish ongoing mechanisms for customer meter accuracy testing, active leakage control and infrastructure monitoring	Refine, enhance or expand ongoing programs based upon economic justification	Stay abreast of improvements in metering, meter reading, billing, leakage management and infrastructure rehabilitation
Long-term loss control		Begin to assess long-term needs requiring large expenditure: customer meter replacement, water main replacement program, new customer billing system or Automatic Meter Reading (AMR) system.	Begin to assemble economic business case for long-term needs based upon improved data becoming available through the water audit process.	Conduct detailed planning, budgeting and launch of comprehensive improvements for metering, billing or infrastructure management	Continue incremental improvements in short-term and long-term loss control interventions
Target-setting			Establish long-term apparent and real loss reduction goals (+10 year horizon)	Establish mid-range (5 year horizon) apparent and real loss reduction goals	Evaluate and refine loss control goals on a yearly basis
Benchmarking			Preliminary Comparisons - can begin to rely upon the Infrastructure Leakage Index (ILI) for performance comparisons for real losses (see below table)	Performance Benchmarking - ILI is meaningful in comparing real loss standing	Identify Best Practices/ Best in class - the ILI is very reliable as a real loss performance indicator for best in class service
	For validity scores of 5	For validity scores of 50 or below, the shaded blocks should not be focus areas until better data validity is achieved	should not be focus areas until	netter data validity is achieved.	

AWWA Free Water Audit Software v5.0

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how well his or her system is performing? The AWWA Water Loss Control Committee provided the following table to assist water utilities is gauging an approximate Infrastructure Leakage Index (ILI) that is appropriate for their water system and local conditions. The lower the amount of leakage and real losses that exist in the system, then the lower the ILI value will be. Once data have been entered into the Reporting Worksheet, the performance indicators are automatically calculated. How does a water utility operator know

Note: this table offers an approximate guideline for leakage reduction target-setting. The best means of setting such targets include performing an economic assessment of various loss control methods. However, this table is useful if such an assessment is not possible.

	General Gui (without doing a full eco	General Guidelines for Setting a Target ILI doing a full economic analysis of leakage control options)	options)
Target ILI Range	Financial Considerations	Operational Considerations	Water Resources Considerations
1.0 - 3.0	Water resources are costly to develop or purchase; ability to increase revenues via water rates is greatly limited because of regulation or low and/or additional water resources to meet the demand.	el nre	Available resources are greatly limited and are very difficult and/or environmentally unsound to develop.
>3.0 -5.0	Water resources can be developed or purchased at reasonable expense; periodic water rate increases can be feasibly imposed and are tolerated by the customer population.	Existing water supply infrastructure capability is sufficient to meet long-term demand as long as reasonable leakage management controls are in place.	Water resources are believed to be sufficient to meet long-term needs, but demand management interventions (leakage management, water conservation) are included in the long-term
>5.0 - 8.0	Cost to purchase or obtain/treat water is low, as are rates charged to customers.	Superior reliability, capacity and integrity of the water supply infrastructure make it relatively immune to supply shortages.	Water resources are plentiful, reliable, and easily extracted.
Greater than 8.0	Although operational and financial considerations mas a resource. Setting a target level greater than 8.	Although operational and financial considerations may allow a long-term ILI greater than 8.0, such a level of leakage is not an effective utilization of water as a resource. Setting a target level greater than 8.0 - other than as an incremental goal to a smaller long-term target - is discouraged.	el of leakage is not an effective utilization of water ing-term target - is discouraged.
Less than 1.0	If the calculated Infrastructure Leakage Index (ILI) valevels in a class with the top worldwide performers in understated. This is likely if you calculate a low ILI beneficial to validate the data by performing field more potential sources of error in the data.	If the calculated Infrastructure Leakage Index (ILI) value for your system is 1.0 or less, two possibilities exist. a) you are maintaining your leakage at low levels in a class with the top worldwide performers in leakage control. b) A portion of your data may be flawed, causing your losses to be greatly understated. This is likely if you calculate a low ILI value but do not employ extensive leakage control practices in your operations. In such cases it is beneficial to validate the data by performing field measurements to confirm the accuracy of production and customer meters, or to identify any other potential sources of error in the data.	exist. a) you are maintaining your leakage at low flawed, causing your losses to be greatly ractices in your operations. In such cases it is and customer meters, or to identify any other

2019 AWWA Water Audit Level 1 Validation

Randy Williamson	This water loss audit report meets the Code Section 10608.34 and has been plin their manual, Water Audits and Loss	Certification Statement by Utility Executive:	2. Leaks are repaired within 1-2 busing	 The City of Los Banos Public Works D stuck, damaged and /or old are replaced. 	Steps taken in preceding year to increc	Water Audit & Water Loss Improvement Steps:	Water System Name:
Water Quality Specialist	requirements of California Code of Regulat repared in accordance with the method adop s Control Programs, Manual M36, Fourth Edi	utive:	2. Leaks are repaired within 1-2 business days. Large leaks (emergencies) are repaired the same day.	s Department continuously changes out, red.	ase data validity, reduce real loss and appo	nt Steps:	Water System ID Number:
Randy Williamson	This water loss audit report meets the requirements of California Code of Regulations Title 23, Division 2, Chapter 7 and the California Water Code Section 10608.34 and has been prepared in accordance with the method adopted by the American Water Works Association, as contained in their manual, Water Audits and Loss Control Programs, Manual M36, Fourth Edition and in the Free Water Audit Software version 5.		paired the same day.	 The City of Los Banos Public Works Department continuously changes out, repairs and replaces customer water meters. Meters that are stuck, damaged and /or old are replaced. 	Steps taken in preceding year to increase data validity, reduce real loss and apparent loss as informed by the annual validated water audit:		Water Audit Period:
8/19/20	ornia Water as contained on 5.			Meters that are	water audit:		

Executive Name (Print)

Executive Position

Signature

Date

ILI: 9.37



2019 AWWA Water Audit Validation - Review Document

Audit Information:

Utility: City of Los Banos

PWS ID: 2410005

Audit Period: Calendar 2019

System Type: Potable

Validation Call Date: 8/4/2020

Utility Representation: Randy Williamson (Water Quality Specialist) Call Time: 8:30am

Sufficient Supporting Documents Provided: Yes

Validation Findings & Confirmation Statement:

Key Audit Metrics:

Data Validity Score: 54

Data Validity Band (Level): Band III (51-70)

Real Loss: 105.66 (gal/conn/day)

Apparent Loss: 8.89 (gal/conn/day)

Non-revenue water as percent of cost of operating system: 4.6%

Certification Statement by Validator

This water loss audit report has been Level 1 validated per the requirements of California Code of Regulations Title 23, Division 2,

Chapter 7 and the California Water Code Section 10608.34.

All recommendations on volume derivation and Data Validity Grades were incorporated into the water audit. oximes

Validator Information:

Water Audit Validator: Larry Lewison, Drew Blackwell

Validator Qualifications: Contractor for California Water Loss TAP